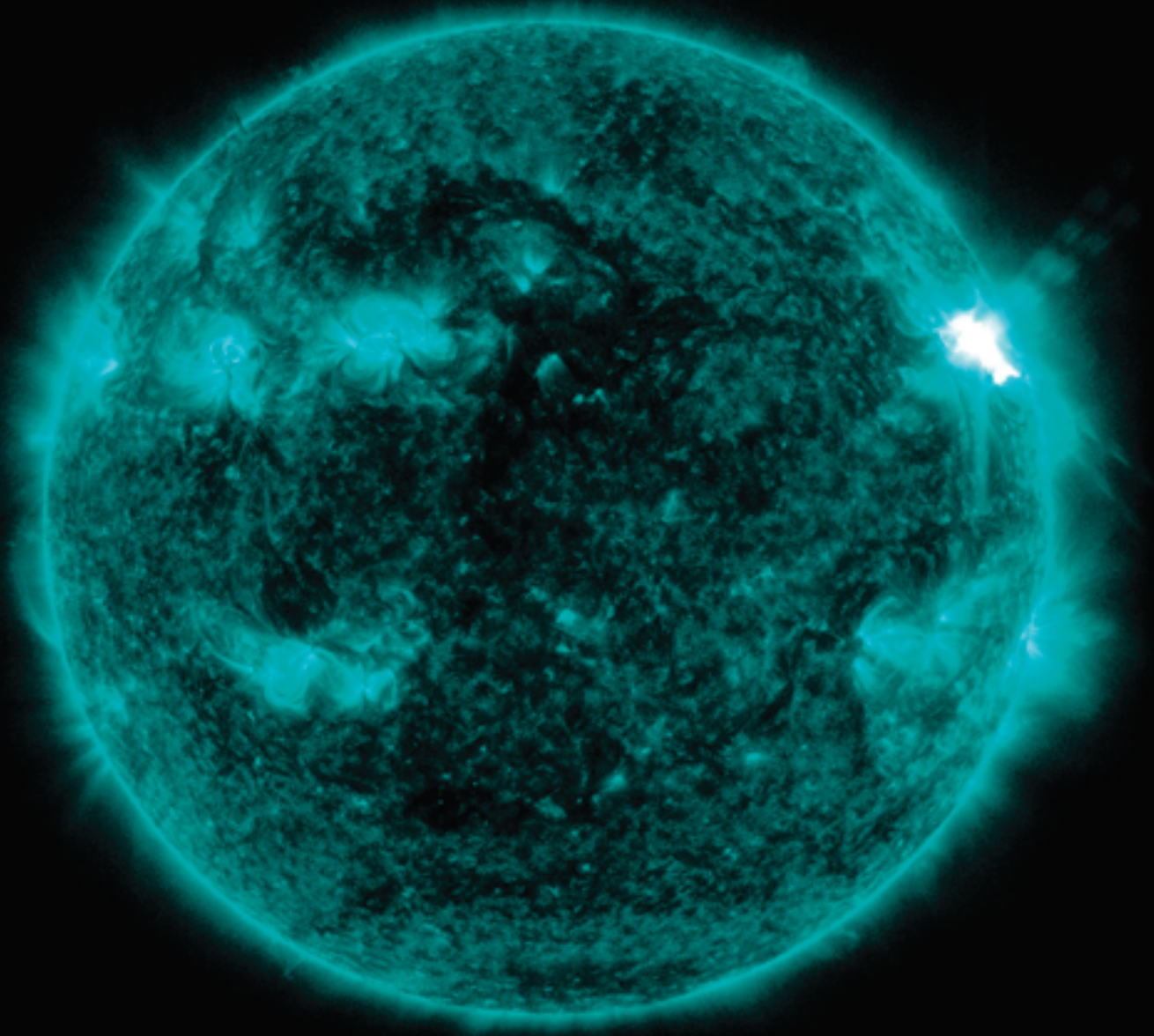


SPACE TIMES

MARCH / APRIL 2012

**THE MAGAZINE OF THE AMERICAN
ASTRONAUTICAL SOCIETY
ISSUE 2-VOLUME 51**





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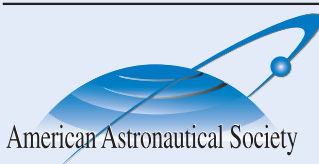
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ON THE COVER

FRONT: NASA's Solar Dynamics Observatory (SDO) captured this image of an M7.9 class flare on March 13, 2012, at 1:29 pm EDT. It is shown here in the 131 Angstrom wavelength, a wavelength particularly good for seeing solar flares and typically colorized in teal. The flare peaked at 1:41 pm EDT and was from the same active region, No. 1429, that produced flares and coronal mass ejections the entire week. (*Source: NASA/SDO*)
BACK: Flying at an altitude of about 240 miles over the eastern North Atlantic, the Expedition 30 crew aboard the International Space Station photographed this nighttime scene. This view looks northeastward with center point coordinates of 46.8 degrees north latitude and 14.3 degrees west longitude. The night lights of the cities of Ireland, in the foreground, and the United Kingdom, in the back and to the right, are contrasted by the bright sunrise in the background. The greens and purples of the Aurora Borealis are seen along the rest of the horizon. (*Source: NASA*)



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The Devastating Impact of a Federal Budget Sequester



I want to share a few thoughts about how a domestic discretionary budget sequester could impact the civil space program. While NASA and industry are creating new capabilities – commercial crew vehicles to reach the International Space Station, the Orion Crew Exploration Vehicle, and Space Launch System to go beyond Earth orbit, new weather satellites, and space telescopes – our Nation's leaders risk allowing a new budget crisis to develop, one that may prove to be more difficult to resolve in the throes of a national election campaign.

Without action by the current President and Congress to resolve their deadlock over spending and revenues, NASA's and NOAA's ability to execute their demanding and ambitious civil space program plans will likely be imperiled by a federal budget sequester – i.e. mandatory cuts – starting on January 2, 2013. Congress and the White House are acting like they can deal with this after the election in November, but we don't really have until next January to fix it – 60 to 90 day layoff notices will have to go out to employees in the fall, and long term contracts with suppliers and prime contractors will also halt as government personnel and industry subcontracting teams hold off pending resolution. Hiring will likely be halted in advance and costs for existing programs will rise since contracts will need to be re-negotiated to account for lower procurement levels.

CBO estimates that non-defense programs would be cut by 7.8% while the Center for Budget and Policy Priorities estimates the cuts to be even higher at 9.1%. A cut of 9.1% to NASA next year would immediately eliminate \$1.6 billion from the agency's budget, and NOAA's weather satellite programs would be cut by \$182 million. Meanwhile, many of these programs are already absorbing reductions from previous budget plans.

As an example, an estimate released last year by Congressman Norm Dicks stated that sequestration would result in a two to four year period in which weather data from NOAA's polar-orbiting satellites would be unavailable, and up to 10% of staffing and resources for local weather warnings and forecasts would be eliminated, putting American communities at greater risk from tornadoes, hurricanes, and other major weather events.

Sequestration would hit space programs like a tidal wave, making the proposed cuts to Planetary Science, Orion, and other areas in the President's budget request seem inconsequential. I urge AAS members to do everything they can – write or visit your Congressmen and Senators; write the President – to prevent sequestration from taking place. Space programs need stability to succeed, and while space has generally been an island of bipartisanship in the ongoing political storm, we may soon be swamped by the unintended consequences of our Nation's partisan deadlock.

AAS – Advancing All Space

A handwritten signature in black ink, appearing to read 'Frank A. Slazer'.

Frank A. Slazer
digaslaze@mac.com

“And Now for Something Completely Different”: Creating Twenty-first Century Space Access

by Roger D. Launius

Like the great Monty Python line — “and now for something completely different” — early in the administration of President Barack Obama in 2009 space policy turned in a direction just as strikingly different as what had taken place in the transition from the Apollo to the Space Shuttle program in the early 1970s. The president convened a blue-ribbon panel chaired by Norm Augustine, the former CEO of Lockheed Martin and a longstanding space guru, that recommended in the fall of that year the harnessing of private sector, especially entrepreneurial,

firms in supporting Earth orbital operations instead of relying on the Constellation program, itself a plan hatched in 2004 to replace the Space Shuttle that was nearing the end of its service life and would be retired in 2011.

Augustine’s report concluded: “Under current conditions, the gap in U.S. ability to launch astronauts into space will stretch to at least seven years. The Committee did not identify any credible approach employing new capabilities that could shorten the gap to less than six years.” This would be true even with increased funding for

NASA’s program.

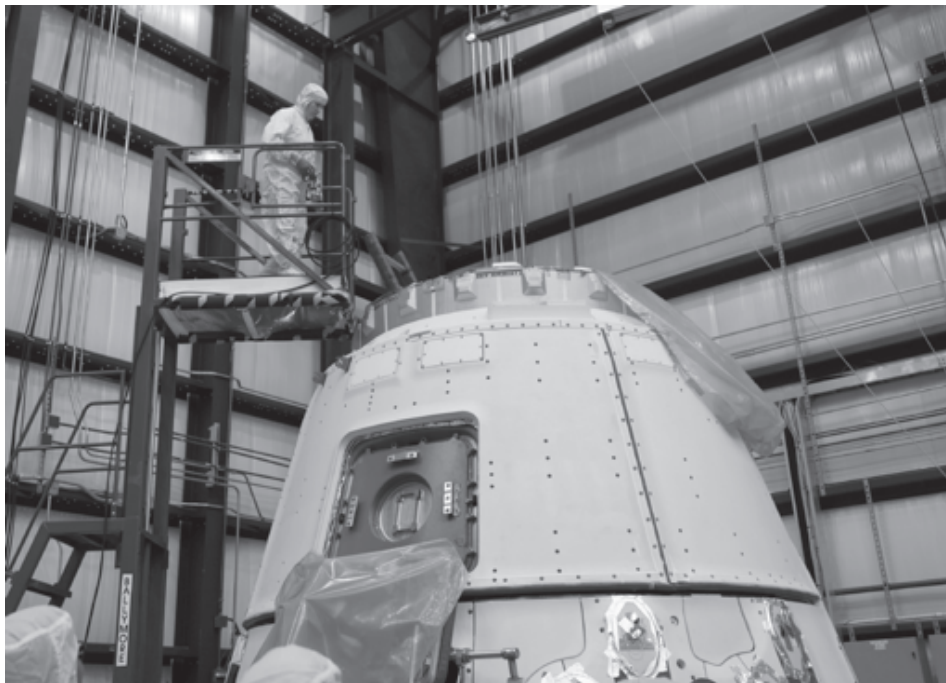
The panel also noted that a \$3 billion a year increase for fiscal years 2010-2014 could return the Constellation program to health. But there was also another option. “As we move from the complex, reusable Shuttle back to a simpler, smaller capsule, it is appropriate to consider turning this transport service over to the commercial sector,” the panel concluded. “This approach is not without technical and programmatic risks, but it creates the possibility of lower operating costs for the system and potentially accelerates the avail-



Blue Origin Orbital Crew Spacecraft in flight (Source: Blue Origin)



Technicians position microphones around the Orion MPCV and LAS test articles in preparation for the second round of testing in the acoustic chamber at Lockheed Martin's facilities near Denver on August 17, 2011. The vehicle was bombarded by acoustic levels of 150 decibels to simulate conditions during launch and abort if necessary. (Source: Lockheed Martin)



The SpaceX Dragon capsule undergoes a crew equipment interface test. (Source: SpaceX)

ability of U.S. access to low-Earth orbit by about a year, to 2016. If this option is chosen, the Committee suggests establishing a new competition for this service, in which both large and small companies could participate.”

The response to this report from the U.S. space community was immediate. Some administration officials urged that the president cancel Constellation. Edward Crawley, a Massachusetts Institute of Technology professor and a member of the Augustine panel, remarked that Ares I was suffering from technical issues that could only be overcome with more money and time. “It was a wise choice at the time,” said Crawley, when asked about originating the program in 2005. “But times have changed,...the budgetary environment is much more tight, and the understanding of the cost and schedule to develop the Ares I has matured.” Others were supportive of continuing Constellation.

Based on these responses, President Obama proposed on February 1, 2010, with more details added in a presidential speech on April 15, a new path for

future U.S. human spaceflight efforts. Central to this would be the termination of the Constellation program as a single entity, continuation of certain technology developments such as the Orion space capsule, the continuation of operations on the International Space Station until at least 2020, and the fostering of private sector solutions to support operations in low-Earth orbit.

Since this declaration numerous high profile spaceflight advocates have weighed in on both sides. In April 2010 Apollo astronauts Neil Armstrong (Apollo 11), Gene Cernan (Apollo 17), and Jim Lovell (Apollos 8 and 13) famously sent the U.S. president a letter warning that the proposed change to human spaceflight “destines our nation to become one of second- or even third-rate stature.” Proponents of the new strategy, among them Apollo 11 astronaut Buzz Aldrin, countered that the president’s approach will return NASA to its roots as a research-and-development organization while private firms operate space systems. Turning low-

Earth orbit over to commercial entities could then empower NASA to focus on deep space exploration, perhaps eventually sending humans to Mars or elsewhere.

The debate has largely been over maintaining a traditional approach to human spaceflight with NASA dominating the effort, owning the vehicles, and operating them through contractors. That was the method whereby America went to the Moon; it has proven successful over fifty years of human space exploration. Then there are those from the “new space” world that emphasize allowing private sector firms to seize the initiative and pursue entrepreneurial approaches to human spaceflight.

Advocates of the more traditional approach believe that the other side will sacrifice safety; advocates of the entrepreneurial approach criticize the forces of tradition by pointing out their large, over-budget, under-achieving space efforts. It remained unclear how much (if any) of this new initiative will be approved by Congress. In 2012 there still was no resolution.

While these concerns are ever-present in the current debate over the future of human transportation into space in the United States, the place of commercial activities in this arena seems assured. There does not look to be any consensus in favor of undertaking a traditional approach to space access, one that NASA dominates both from a market standpoint and an ownership imperative. As space policy analyst Stewart Money commented in the *Space Review* in 2011: “While the market for publically-funded commercial crew transport to ISS is clearly limited, it is becoming increasingly certain. NASA Administrator Charles Bolden’s emphatic declaration in support of commercial crew may well signify a bellwether date in space history.... The most significant implication may

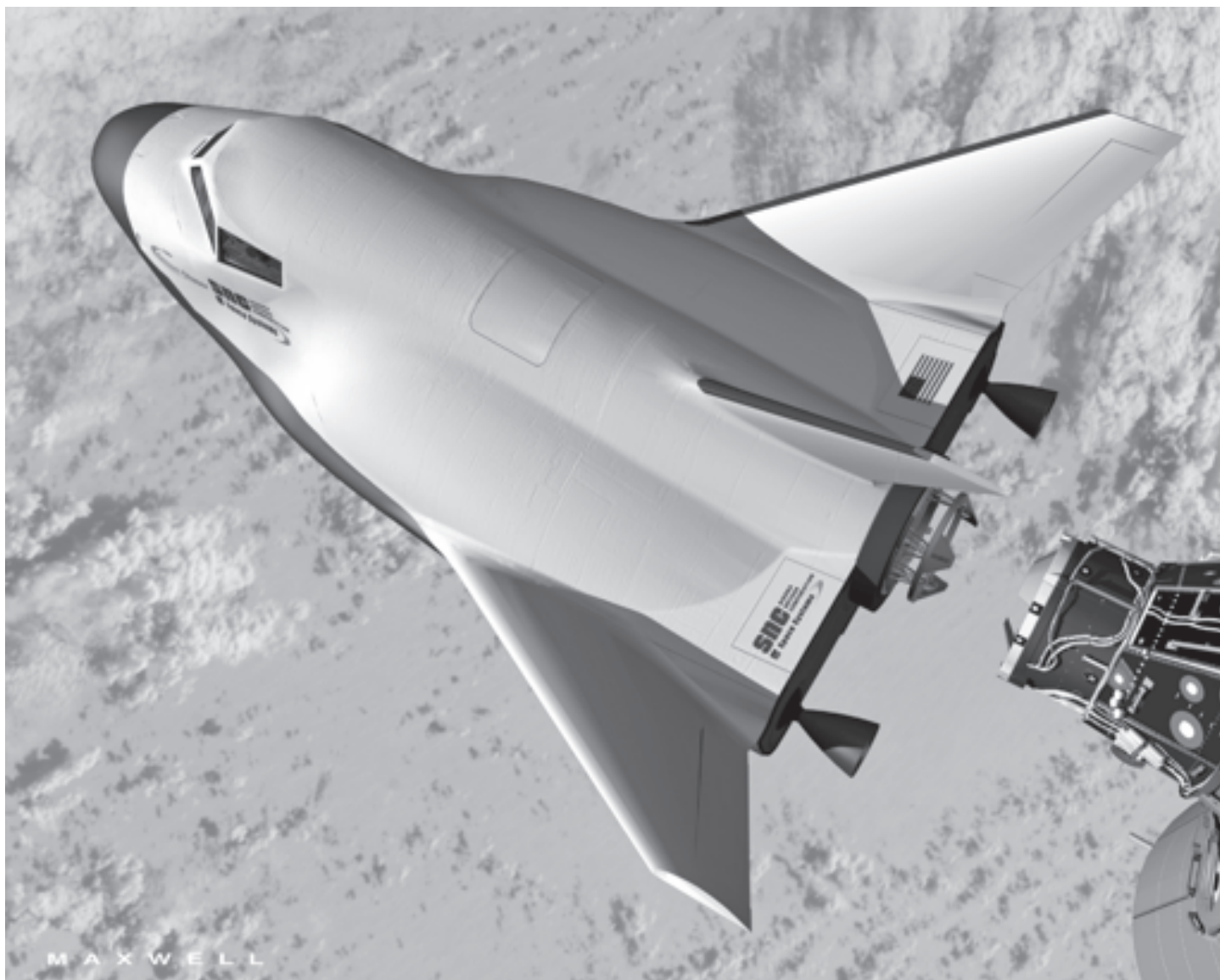
be that other opportunities for leveraging the spacecraft initially offered for ISS cargo and crew duties can begin to emerge in earnest....The fact that several of the proposed crew transport craft are promoted as being able to launch on more than one rocket indicates an encouraging shift in the way some aerospace companies are approaching the marketplace. It is something more akin to an aircraft manufacturer's role, an analogy Boeing was happy to make in the same announcement...Taken together, these developments, along with

others, offer the tantalizing possibility of being the opening act in a new era of both public and private spaceflight to low Earth orbit.

In this situation, furthermore, issues of reusability have largely been forgotten, despite this critical necessity in developing a cost effective replacement for the Space Shuttle."

During 2010 and 2011 NASA pursued efforts to replace the vehicle providing access to low-Earth orbit previously offered by the Space Shuttle through a multiphase space technology

development program known as Commercial Crew Development (CCDev). Intended to stimulate development of privately operated crew vehicles to low-Earth orbit, its first phase offered a token sum of \$50 million during 2010 to stimulate five American companies to undertake research and development of new human spaceflight concepts and technologies. In its second phase, with contracts of \$269 million awarded to four firms in April 2011, the objective was to move toward the establishment of one or more orbital spaceflight capa-



The Dream Chaser® Space System is a crew and cargo transportation system designed to service low Earth orbit, including the International Space Station. (Source: Sierra Nevada Corporation)



45th Space Wing launch of a United Launch Alliance-built Atlas V carrying an X-37B Orbital Test Vehicle on April 22, 2010 (Source: ULA/Pat Corkery)

bilities on which NASA could purchase cargo and eventually crew space.

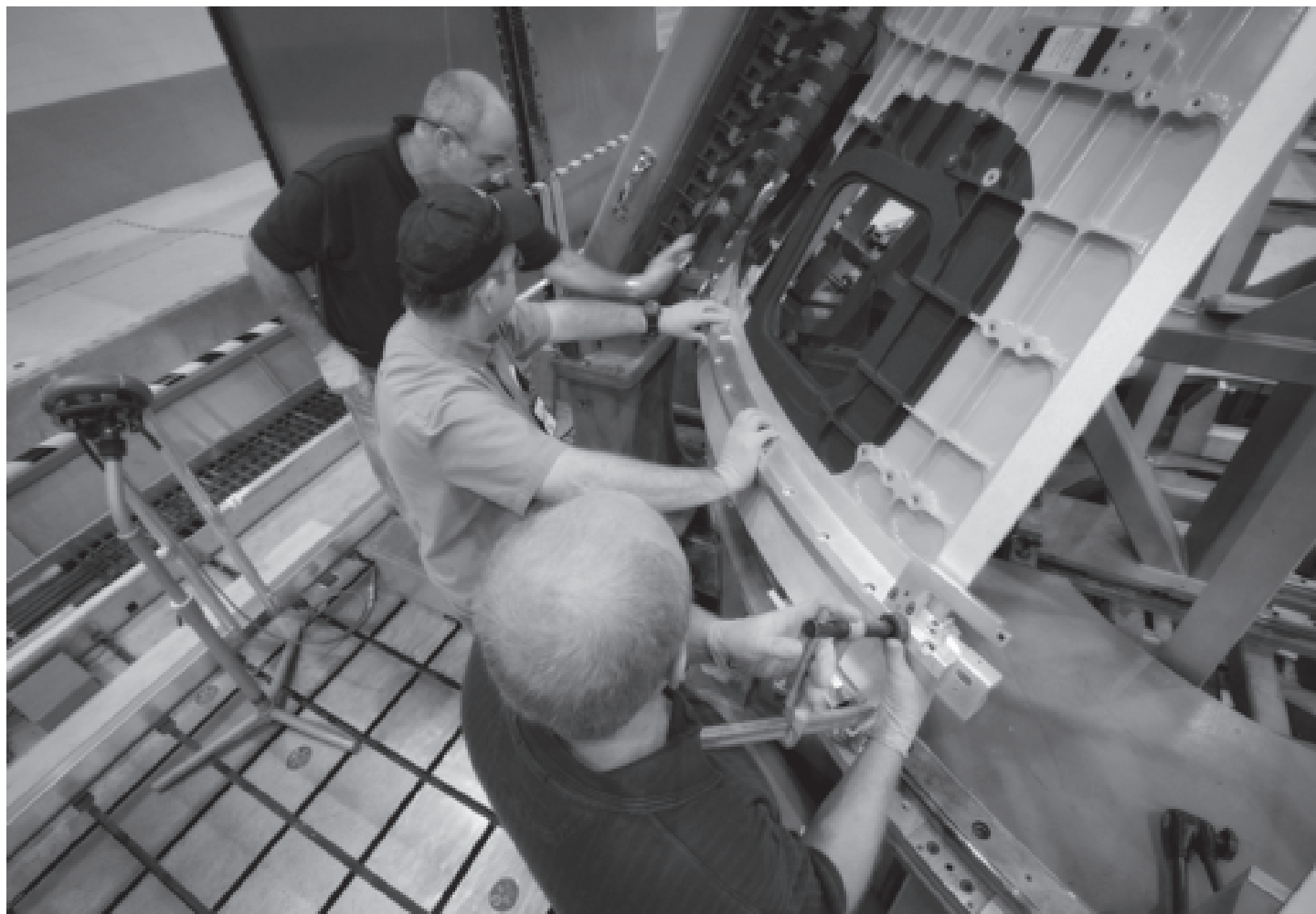
The awardees were all American firms and their approaches ranged from lifting body to capsule spacecraft. Those companies — Blue Origin, Sierra Nevada Corporation, Space Exploration Technologies (SpaceX), and Boeing — are envisioned as a vanguard that will be able to usher in a new era of innovative human spaceflight opportunities. As announced by Ed Mango, NASA's Commercial Crew Program manager: "The next American-flagged vehicle to carry our astronauts into space is going to be a U.S. commer-

cial provider. The partnerships NASA is forming with industry will support the development of multiple American systems capable of providing future access to low-Earth orbit."

This ferment of ideas and broad set of actions stimulated through the CCDev program suggest that the issue of human space activities remains an unsettled issue. The longstanding set of issues and trade-offs necessary to fly into space safely, perform useful missions on-orbit, and return to the ground in not only a safe but an elegant manner remain very much on the table as 2012 begins. While they may have benefited

from changes in technology and greater knowledge of the processes involved in development and using these capabilities, discovering optimal solutions, as well as the most elegant of them, requires diligence and creativity.

The spacecraft nearest to being ready for operational use might well be the SpaceX Dragon capsule launched atop the Falcon 9 rocket. With its successful suborbital test flight on December 8, 2010, the SpaceX entry into this competition appeared destined for an early operational capability. This is a use-once/throw away space access combination similar to what has been used



Construction on the first space-bound Orion Multi-Purpose Crew Module began with the first weld at the Michoud Assembly Facility on September 9, 2011. This is the capsule that will be used during Orion's first test flight in space. After welding is completed at Michoud, the Orion spacecraft orbital test article will be shipped to NASA's Kennedy Space Center (KSC), where the heat shield will be installed. At KSC, it will undergo final assembly and checkout operations for eventual flight. (Source: NASA)



The SpaceX Falcon 9 carrying a Dragon capsule lifts off the launch pad at Launch Complex 40 at Cape Canaveral Wednesday, December 8, 2010, to begin what would be a successful test flight for its program designed to deliver cargo to the International Space Station. (Source: NASA/Alan Ault)

for decades, but it is intended to be less expensive than comparable systems already available. Even so, test flights for the Falcon 9/Dragon capsule have been repeatedly postponed, and no launch is scheduled until later in 2012.

The second awardee, garnering the largest award of \$92.3 million, was Boeing. Its CST-100 crew capsule has been pursued as a support vehicle for the International Space Station. Very close in design to the Orion spacecraft of the Constellation program, but without the deep space capability, it was intended to house crews as large as seven and could be attached to ISS for more than half a year before requiring swap-out. In every case, Boeing has emphasized the long history it has in developing and operating the technologies going into the CST-100. Boeing officials have projected flight for this vehicle in 2015.

Another recipient of the CCDev award, but receiving only \$22 million, was Blue Origin, a start-up entrepreneurial firm that proposed developing a biconic orbital capsule launched atop an Atlas V. Information about this project is limited, Blue Origin is reticent to speak in public about its activities. As Dan Rasky of NASA Ames remarked in mid-2011: "I joke with people that if you want to see what a billionaire's clubhouse looks like, go visit Blue Origin."

Finally, the CCDev program awarded an \$80 million contract to the Sierra Nevada Corp. to build a commercial Space Transportation System based on NASA HL-20 and launched on an Atlas V. This Dream Chaser lifting body spacecraft would utilize Virgin Galactic's carrier aircraft as a platform for atmospheric drop tests as early as 2012. As a lifting body, this vehicle is intended to land on a runway and be reusable. Its carbon composite airframe looks large, but weighing only 27,100 lbs, it is actually quite light because of

the composite structure. For all of the spaceplane's sleekness, as one commentator noted, it could handle only 1500K cargo and only 2 crew. This is a good looking vehicle, but it is not a mini Shuttle. It is a minuscule Shuttle."

Some successes have been registered since this point, most especially the Falcon 9/Dragon capsule flight in late 2010. But this approach has a bit of risk. If it pays off, it may set the stage for an entirely new trajectory in human space operations. If it fails, it will require a retrenchment of American human operations in space and a reinvestment of public dollars. Nothing about this is settled, including the policy implications. John M. Logsdon recently commented that in forty years of watching space policy he has not seen such an unsettled situation. This may be an understatement.

Perhaps the private sector efforts of SpaceX, Orbital Sciences, and others will come to the rescue of human spaceflight in the United States. The successes thus far in this direction are positive signs, but I urge caution in trumpeting this as THE answer to the nation's human space access dilemma. Although the trajectory is positive, the CCDev firms still have a long road to hoe before achieving an operational system. Likewise, the U.S. Air Force's recent success with a modified X-37B reusable orbital vehicle suggests that innovation for non-crewed military purposes may also be applicable to NASA's human spaceflight program.

Interestingly, beyond technology R&D at NASA — which of course may be critical to the next human spaceflight system — the space agency may well have to look beyond its personnel and its various centers for the next human space access system. This is not unprecedented, but it is troubling after more than forty years of being able to harness on its own capabilities to resolve these technological challenges.

The space agency relied on modified ballistic missiles developed by the military to launch its Mercury and Gemini spacecraft into orbit, but since Apollo it has owned and operated its own systems.

President Obama's decision to rely on private sector efforts to develop next generation human space access capabilities was a bold, controversial initiative. However it turns out, it represents a path that harkens back to an earlier model in which NASA had more equal partnerships with other organizations to accomplish its space exploration mandate. I am heartened by recent developments in this arena. Of course, if this fails, it is quite possible in the next few years that America may find itself without a human spaceflight capability indefinitely.

At this point in the history of human spaceflight, more than fifty years after Allan Shepard made his first suborbital flight and John F. Kennedy challenged Americans to reach the Moon by the end of the 1960s, it is appropriate to consider the possible futures for American astronauts in space. I am reminded of a statement that has been used repeatedly to suggest American ingenuity: "If we can send a man to the Moon..." But I would then end the phrase with this question, "...how come we can't send a man to the Moon?" Are we seeing U.S. leadership decline in this most exclusive of all endeavors undertaken by great nations of the world?

A lesson in humility might spur a

national commitment to redouble our efforts. The late social commentator and comedian Sam Kinison once said to other nations seeking to undertake space spectacles: "You really want to impress us! Bring back our Flag!" If Americans are sufficiently impressed that another nation can do things in space that we cannot, we may come to view this as a crisis, and as is always the case in a perceived crisis, the U.S. will make the investment necessary to overcome it. Maybe China, India, or any number of other nations seeking to advance their national prestige will bring back our flag from the Moon, metaphorically at least, and prompt us to redouble our efforts.

With sufficient diligence and resources, of course, virtually anything humans can imagine in spaceflight may be achieved. We should be concerned, however, that neither sufficient diligence nor resources will be available for this great initiative. In the process of failure, we may also lose our longstanding intrinsic ability for access to space with our seasoned, capable, and resolute astronaut corps. These outcomes are most unsettled presently; how long can we accept this unsettled situation?

Dr. Roger D. Launius is a senior curator in the Space History Division of the Smithsonian Institution's National Air and Space Museum in Washington, D.C.

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AAS Events Schedule

May 15-18, 2012

**13th International Space Conference of
Pacific-basin Societies (ISCOPS)**

Kyoto International Community House
Kyoto, Japan
www.jrocket.org

June 8-10, 2012

***Student CanSat Competition**

Abilene and Burkett, Texas
www.cansatcompetition.com

June 26-28, 2012

**1st Annual International Space Station (ISS)
Research and Development Conference**

Denver Marriott City Center
Denver, Colorado
www.astronautical.org

August 13-16, 2012

AIAA/AAS Astrodynamics Specialist Conference

Hyatt Regency Minneapolis
Minneapolis, Minnesota
www.aiaa.org

October 1-5, 2012

International Astronautical Congress (IAC)

Naples, Italy
www.iac2012.org

October 16-17, 2012

5th Wernher von Braun Memorial Symposium

The University of Alabama in Huntsville
Huntsville, Alabama
www.astronautical.org

November 28-29, 2012

AAS National Conference

Jet Propulsion Laboratory
Pasadena, California
www.astronautical.org

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CALL FOR PAPERS

23rd AAS/AIAA Space Flight Mechanics Meeting Kauai Marriott Resort Lihue, Kauai, Hawaii February 10-14, 2013

The 23rd Space Flight Mechanics Meeting will be held February 10-14, 2013, at the Kauai Marriott Resort in Lihue, Kauai, Hawaii. The conference is organized by the American Astronautical Society (AAS) Space Flight Mechanics Committee and co-sponsored by the American Institute of Aeronautics and Astronautics (AIAA) Astrodynamics Technical Committee. Manuscripts are solicited on topics related to space flight mechanics and astrodynamics, including but not limited to:

- Asteroid and non-Earth orbiting missions
- Atmospheric re-entry guidance and control
- Attitude dynamics, determination, and control
- Attitude-sensor and payload-sensor calibration
- Dynamical systems theory applied to space flight problems
- Dynamics and control of large space structures and tethers
- Earth orbital and planetary mission studies
- Flight dynamics operations and spacecraft autonomy
- Orbit determination and space-surveillance tracking
- Orbital debris and space environment
- Orbital dynamics, perturbations, and stability
- Rendezvous, relative motion, proximity missions, and formation flying
- Reusable launch vehicle design, dynamics, guidance, and control
- Satellite constellations
- Spacecraft guidance, navigation, and control (GNC)
- Trajectory / mission / maneuver design and optimization
- The Dawn and GRAIL missions



Manuscripts will be accepted based on the quality of the extended abstract, the originality of the work and/or ideas, and the anticipated interest in the proposed subject. Submissions that are based on experimental results or current data, or report on ongoing missions, are especially encouraged.

Complete manuscripts are required before the conference. English is the conference working language.

SPECIAL SESSIONS

Proposals are being considered for suitable special sessions, such as topical panel discussions, invited sessions, workshops, mini-symposia, and technology demonstrations. A proposal for a panel discussion should include the session title, a brief description of the discussion topic(s), and a list of the speakers and their qualifications. For an invited session, workshop, mini-symposium, or demonstration, a proposal should include the session title, a brief description, and a list of proposed activities and/or invited speakers and paper titles. Prospective special-session organizers should submit their proposals to the Technical Chairs.



BREAKWELL STUDENT TRAVEL AWARD

The AAS Space Flight Mechanics Committee announces the John V. Breakwell Student Travel Award. This award provides travel expenses for up to three (3) U.S. and Canadian students presenting papers at this conference. Students wishing to apply for this award are strongly advised to submit their completed manuscript by the abstract submittal deadline. The maximum coverage per student is limited to \$1000. Details and applications may be obtained via <http://www.space-flight.org>.

INFORMATION FOR AUTHORS

Because the submission deadline of October 1, 2012 has been fully extended for the convenience of contributors, there are no plans to defer this deadline due to the constraints of the conference planning schedule. Notification of acceptance will be sent via email by November 12, 2012. Detailed author instructions will be sent by email following acceptance. By submitting an abstract, the author affirms that the manuscript's majority content has not been previously presented or published elsewhere.

Authors may access the web-based abstract submittal system using the link available via the official website <http://www.space-flight.org>. During the online submission process, authors are expected to provide:

1. a paper title, as well as the name, affiliation, postal address, telephone number, and email address of the corresponding author and each co-author;
2. an extended abstract in the Portable Document File (PDF) format of at least 500 words that includes the title and authors, and provides a clear and concise statement of the problem to be addressed, the proposed method of solution, the results expected or obtained, and an explanation of its significance to astrodynamics and/or space-flight mechanics, with pertinent references and supporting tables and figures as necessary; and
3. a condensed abstract (100 words) to be included in the conference program, which is directly typed into the text box provided on the web page and avoids the use of special symbols or characters, such as Greek letters.

Foreign contributors requiring an official letter of acceptance for a visa application should contact the Technical Chairmen by email at their earliest opportunity.

Technology Transfer Notice – Technology transfer guidelines substantially extend the time required to review abstracts and manuscripts by private enterprises and government agencies. To preclude late submissions and withdrawals, it is the responsibility of the author(s) to determine the extent of necessary approvals prior to submitting an abstract.

No-Paper/No-Podium Policy – A complete manuscript must be electronically uploaded to the web site prior to the conference in PDF format, be no more than twenty (20) pages in length, and conform to the AAS manuscript format. If a complete manuscript is not received on time, then its presentation at the conference shall be forfeited; and if a presentation is not made by an author at the conference, then the manuscript shall be omitted from published proceedings.

Questions concerning the submission of manuscripts should be addressed to the Technical Chairs.

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In Memoriam - Malcolm David Shuster

Malcolm David Shuster died on February 23, 2012, after a long battle with chronic illnesses. With his passing, the astronautics community lost a unique voice, an esteemed colleague, and a cherished mentor.

Malcolm was born in Boston, Massachusetts and spent his formative years in Revere, Massachusetts. He received the S.B. degree in physics in 1965 from the Massachusetts Institute of Technology and the Ph.D. in physics in 1971 from the University of Maryland. He then embarked on a brief but productive career in physics, holding positions with the Center for Nuclear Studies (Saclay, France), the University of Karlsruhe (Karlsruhe, West Germany), Tel-Aviv University (Tel-Aviv, Israel), and Carnegie-Mellon University (Pittsburgh, Pennsylvania). He taught physics courses at all levels and carried out research on the interaction of elementary particles with nuclei. Many of his physics articles continue to be cited.

Malcolm changed his career path to aerospace in 1977, joining the Attitude Systems Operation of the Computer Sciences Corporation (CSC) in Silver Spring, Maryland. At CSC he developed the QUEST (QUaternion ESTimator) algorithm for attitude estimation. This algorithm is a key component of many space and robotics applications, and is an accomplishment for which Malcolm will always be remembered.

During the 1980s, Malcolm frequently served as an adjunct graduate professor of Mechanical Engineering at Howard University, and gave his course on *Spacecraft Attitude Estimation* at The Johns Hopkins university Applied Physics Laboratory (APL), Laurel, Maryland. Malcolm began working with greater intensity on problems of spacecraft attitude estimation after joining the Space Department of APL in 1987. In 1993, he and John L. Junkins were guest editors of

a special issue of *The Journal of the Astronautical Sciences*, for which Malcolm provided an invaluable 79-page survey of attitude representations. From 1994 until 1999 he was professor of Aerospace Engineering, Mechanics, and Engineering Science at the University of Florida, Gainesville, Florida.

Malcolm was with the Orbital Sciences Corporation in Germantown, Maryland, from 1999 to 2001. Due to a succession of illnesses, he essentially stopped working in the summer of 1999 and was not employed after 2001. His subsequent publications appeared under the fictitious banner of the Acme Spacecraft Company, of which he styled himself Director of Research. Two of his last papers, "The Arts and Engineering" and "Advice to Young Researchers," published in the *IEEE Control Systems Magazine*, reflected his strong pedagogical interests.



Malcolm was the author or coauthor of more than sixty journal articles - many of which has become key papers - and a comparable number of conference papers. He was a fellow of the American Astronautical Society (AAS) and of the British Interplanetary Society, an associate fellow of the American Institute of Aeronautics and Astronautics (AIAA), and a senior member of the Institute of Electrical and Electronics Engineers (IEEE). He was also a member of the American Physical Society and the Society for Industrial and Applied Mathematics. In 2000 the AAS presented its Dirk Brouwer Award to Malcolm, and in June 2005 held a special three-day astronautics symposium in his honor.

Malcolm's parents predeceased him. he was an only child and never married. His friends and colleagues were his family.



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The 50th annual Robert H. Goddard Memorial Symposium was held March 27-29, 2012, at the Greenbelt Marriott in Greenbelt, Maryland. This year's theme, "Dreams and Possibilities: Planning the Achievable," provided an opportunity for presentations, panel discussions, and displays about current successes and the future direction of NASA and the aerospace industry. The emphasis was on missions that were achievable within about a half-decade — those space activities that are on the horizon, just beginning to take shape, or will guide current investments and programmatic decisions.

Supported by the NASA Goddard Space Flight Center and corporate sponsors, the symposium brought together leaders in government, industry, and academia to discuss recent political and budgetary decisions and challenges.

Dr. Steve Squyres, Chair of the



Steve Squyres (Source: NASA/William Hrybyk)



NASA Administrator Charlie Bolden, NASA Exceptional Service Medal awardee Mary Glackin, and NASA Goddard Space Flight Center Director Chris Scolese (Source: NASA/William Hrybyk)

NASA Advisory Council, and NASA Administrator Charlie Bolden, Jr., were the keynote speakers for the first day. Kathryn Sullivan, Assistant Secretary of Commerce for Environmental Observation and Prediction, NOAA, opened the second day of the symposium. Congressman Ralph Hall (R-TX), Chairman of the House Committee on Science, Space and Technology, and RADM Liz Young, USN (ret) from the National Reconnaissance Office gave luncheon key-

note talks.

Honored at the first day's Awards Luncheon were Congressman Hall, who received the 2011 John F. Kennedy Astronautics Award; Nancy Grace Roman, who received her second William Randolph Lovelace II Award; Thomas Stafford, who together with Alexi Leonov won the 2012 Award for the Advancement of International Cooperation; and John Logsdon and Asif Siddiqi, co-recipients of the 2010 Eugene M. Emme Award for

Astronautical Literature. Rob Strain, former director of the Goddard Space Flight Center, received a special Goddard Medal.

Other speakers included Dr. John Grunsfeld, NASA Science Mission Directorate Associate Administrator; Dr. Waleed Abdalati, NASA Chief Scientist; and Dr. Michael Hesse, NASA GSFC Heliophysics Division Director. Panels addressing the goals of NASA's Strategic Plan were moderated by Frank Moring, Waleed Abdalati, James Reuther, Freeman Hrabowski, Olga Dominguez, and Nancy Colleton. Closing remarks and observations were provided by Marcia Smith and Roger Launius.

Speaker and panel presentations are posted at www.astronautical.org



Human Exploration Strategy Panel (Source: NASA/William Hrybyk)



Liz Young (Source: NASA/William Hrybyk)



Roger Launius (Source: NASA/William Hrybyk)



Charlie Bolden and University of Illinois students (Source: NASA/William Hrybyk)



Kathryn Sullivan (Source: NASA/William Hrybyk)



50th Robert H. Goddard Memorial Symposium Award Recipients



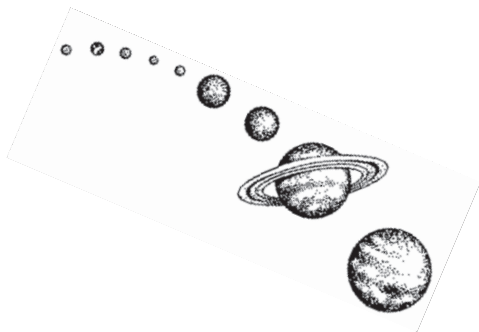
Ralph Hall and AAS President Frank Slazer
(Source: NASA/William Hrybyk)



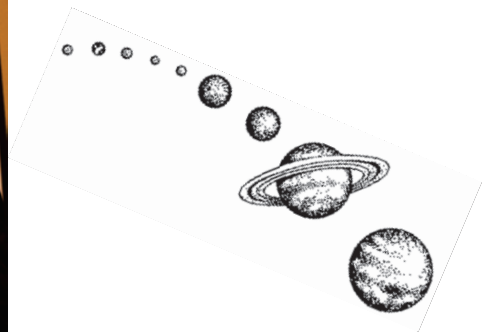
Lance Bush and Thomas Stafford
(Source: NASA/William Hrybyk)



Nancy Grace Roman
(Source: NASA/William Hrybyk)



Rob Strain (Source: NASA/William Hrybyk)

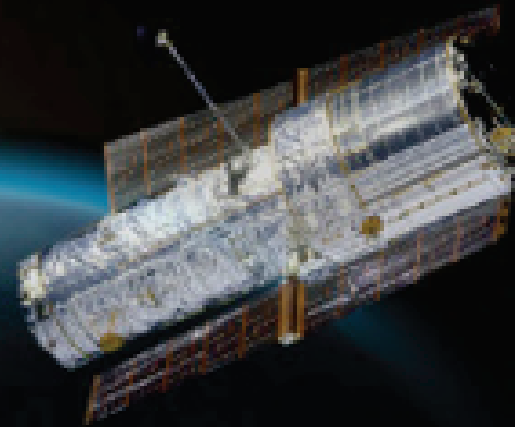


John Logsdon (Source: NASA/William Hrybyk)



Asif Siddiqi (Source: NASA/William Hrybyk)

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Guidelines for Submission of Articles for Publication in *SPACE TIMES*

SPACE TIMES is a magazine, as opposed to a technical journal; therefore, articles should be written in active voice, with a clear explanation of technical concepts provided. The tone should lean more towards conversational rather than formal. Articles should also be written for a well-educate audience that has a great interest in space topics but may not necessarily be familiar with your specific topic. Virtually any topic involving space science, technology, exploration, law, or policy may be covered. Issues relevant to the civil, commercial, and military and intelligence space sectors alike are also welcomed.

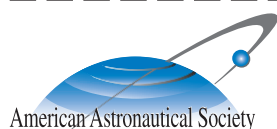
Feature articles (1,500-3,000 words), op-eds (500-1,500 words), and book reviews (600 words or less) are accepted. Excpetions will be handled on a case-by-case basis.

Articles must be submitted in Microsoft Word format, Times New Roman font, 10.5 pt. Other formatting will be handled by the production manager during the editing process.

Submission of photos or other visual support is strongly encouraged but not required. If submitted, images must be provided in high resolution of at least 300 dpi in JPG or TIF format (CMYK for color and grayscale for black and white). Visuals should not be embedded in the submitted article but must be provided separately. Proof of permission from the owner of any photos or other visuals, or contact information for the owner if permission has not been secured prior to submission of an article, must be provided.

Articles must include: (1) a title; (2) a subtitle or one to two sentence summary of the topic covered; (3) subheadings to provide separation between major sections of the article, if applicable; (4) a one to two sentence byline/author biography which will appear at the end of the article; and (5) the current mailing address of the author(s). Five complimentary copies of the issue in which the article appears will be mailed to each author.

The submission deadline is the 15th of the month prior to the issue date (i.e., June 15 for the July/August issue). Please submit articles to aas@astronautical.org, or contact the AAS office at 703-866-0020.



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SpaceShipOne, An Illustrated History

Reviewed by James M. Busby

SpaceShipOne, An Illustrated History, by Dan Linehan. Zenith Press. 160 pages. ISBN: 978-0-7603-3188-0. \$34.95 (U.S. price).

As you read this, SpaceShipTwo may have undergone its first manned drop tests. You might be wondering if there are any good books about civilian space flight and how we got to this point. This may not necessarily be the best title for that purpose. Have you ever picked up a book, hoping to learn about wondrous space and science discoveries, but instead found simplified facts and figures that almost spoke down to your level of intelligence?

Maybe I expected too much from a new author. The book does practice truth in advertising. It is exactly what the title suggests – an illustrated history. The subject is Burt Rutan's SpaceShipOne, which won the Ansari X-Prize. The book is lavishly illustrated with photographs and beautiful charts and graphs. I had hoped for something more.

Dan Linehan was allowed inside the Scaled Composites facilities in Mojave, California, during the construction of the SS-1 and White Knight One. He had access to the exclusive story of the little



spaceship that could. I was expecting a hard hitting, behind-the-scenes examination of the program, spacecraft, and the people surrounding the X-Prize. What I got is an introductory book that could be titled “SpaceShip 101.”

The author spends much of his writing explaining the fringes of atmosphere where space begins, the X-Prize, the basics of flight and rocketry, who the other contenders were (it turns out Rutan was the only serious contender, and no one else has since flown), and general biographies that could have been read on the internet.

I wanted to know more about the con-

troversies surrounding the prize, the design of the rocket engine, and the people involved. I wanted to know about Paul Allen's involvement, and why SS-1 never carried the pilot and passengers it was required to carry to win the X-Prize – although SS-1 won the prize anyway. I was also really surprised that there was not more attention regarding Mike Melville's “whirl-a-gig” flight and the nearly thirty rolls he made on the first X-Prize qualifying flight – how close to failure was that flight?

This is a gorgeous book, but if you seek a scientific and technical text, you will probably have to wait until Dan Linehan's next book, or for one from another author.

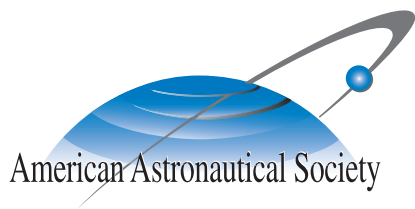
James M. Busby is not a scientist or engineer, but as a historian was in the room when Peter Diamandis first proposed a multi-million dollar prize for spaceflight to the Space Frontier Foundation. He briefly worked for a company in Mojave, was at the X-Prize flights, and spoke with Bert Rutan the night before winning the prize about the similarities between the Orteig and X-Prizes.

Charitable Giving and the AAS

A popular way of donating to an organization is through a gift by means of a will (i.e., to make a bequest). You may decide to consider either a general bequest to the AAS or a bequest targeted to an existing or new AAS scholarship or an award fund. These bequests are deductible against estate and inheritance taxes.

There are also tax advantages when making charitable donations to the AAS while you are living. Such gifts could contribute to the memory of someone who has passed away or be made in the honor of a person who is still alive. In addition, special occasions offer opportunities for gifts to be directed to the Society.

As a final note, although the AAS is able to provide suggestions for charitable giving, your financial or legal advisor should be consulted about such actions.



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